

Elective Transcervical Superior Mediastinal Lymph Node Dissection For Advanced Laryngeal and Level 4 N3 Squamous Cell Carcinoma

Lance E. Oxford, MD; Yadranko Ducic, MD, FRCS(C), FACS

Objectives: To review our results with elective superior mediastinal lymph node dissections in patients with advanced laryngeal squamous cell carcinoma (SCCA) and overt level 4 adenopathy. **Study Design:** Retrospective review. **Methods:** We searched operative case logs for all patients treated with an elective superior mediastinal dissection by the senior author (Y.D.) during a 7-year period. Charts were reviewed for demographic information, prior treatment with chemotherapy or radiotherapy, and pathologic results. **Results:** Fifty-six patients who underwent elective superior mediastinal lymph node dissection for advanced laryngeal SCCA and overt level 4 adenopathy were reviewed, and superior mediastinal disease was present in 15 of 56 (26.8%) patients. Superior mediastinal nodes were positive in 11 of 42 (26.2%) patients with advanced laryngeal SCCA and 4 of 14 (28.6%) patients with N3 SCCA involving level 4. Patients with SCCA receiving prior chemotherapy and radiotherapy had a significantly higher rate of positive superior mediastinal nodes (10/21 patients, 47.6%) compared with patients without prior therapy (5/35 patients, 14.3%, $P = .01$, Fisher's exact test). There were no stomal recurrences in 42 patients treated for advanced laryngeal cancer. **Conclusions:** Elective transcervical superior mediastinal dissection was positive in 26.8% of patients with advanced laryngeal cancer or N3 disease in level 4. A transcervical superior mediastinal dissection may be safely performed without a sternotomy.

Laryngoscope, 115:625–628, 2005

From the Department of Otolaryngology—Head and Neck Surgery, University of Texas Southwestern Medical Center, Dallas, Texas; and the Division of Otolaryngology and Facial Plastic Surgery, John Peter Smith Hospital, Fort Worth, Texas, U.S.A.

Editor's Note: This Manuscript was accepted for publication November 23, 2004.

Address correspondence to Dr. Y. Ducic, Director, Otolaryngology and Facial Plastic Surgery, John Peter Smith Hospital, 1500 South Main Street, Fort Worth, Texas 76104. E-mail: yducic@sbcglobal.net

DOI: 10.1097/01.mlg.0000161336.69762.5d

INTRODUCTION

Elective neck dissection has become an accepted management of cervical lymphatics in selected patients with head and neck squamous cell carcinoma (SCCA). In addition to the potential benefit of more accurate staging of a head and neck malignancy, elective neck dissections may provide a therapeutic treatment to decrease regional recurrence of disease and improve survival.^{1,2} Treatment of the cervical lymphatics with a neck dissection or irradiation is recommended when the risk of occult neck disease is greater than or equal to 20%.³ Although the role of elective dissection of cervical lymphatics is well established, the indications for elective superior mediastinal dissection are less clear. Several authors have recommended elective mediastinal dissections with esophageal carcinomas because of the 61.5% to 84% incidence of nodal disease seen in their studies.^{4,6} Superior mediastinal dissections have been reported with and without a sternotomy.^{4,5} A recent study evaluating transcervical paratracheal nodal dissection with extension inferior to the suprasternal notch in patients undergoing total laryngectomy reported a 26% incidence of positive nodes.¹³ The goal of this study is to review our series of elective transcervical superior mediastinal dissections in patients with advanced laryngeal carcinoma and N3 SCCA involving level 4.

METHODS

We retrospectively reviewed patients with head and neck SCCA who underwent elective transcervical superior mediastinal dissection by the senior author (Y.D.) from September 1997 to March 2004 and had a minimum follow-up of 6 months. The senior author's criteria for elective superior mediastinal dissection were implemented at the beginning of the study period, and all patients meeting the criteria during the study period underwent elective superior mediastinal dissection. Records were reviewed for demographic data, histologies of the primary tumor, incidence of mediastinal nodal metastasis, and postoperative complications. Data were analyzed with SPSS 11.0 software (Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL).

All patients in this series were evaluated with a contrasted computed tomography scan preoperatively and did not have obvious superior mediastinal lymphadenopathy. The criteria for

elective superior mediastinal dissections were: 1) laryngeal cancer with airway obstruction, transglottic extension, or subglottic extension greater than 1 cm inferior to the vocal ligaments, 2) head and neck SCCA with N3 disease in level 4, and 3) any palpable abnormalities in the superior mediastinum noted intraoperatively. The criteria were based on the senior author's (Y.D.) experience to select patients at increased risk for locoregional recurrence that could potentially benefit from an extended lymphatic dissection. N3 disease is defined by size greater than 6 cm, and level 4 is defined superiorly by the omohyoid muscle, inferiorly by the clavicle, anteriorly by the common carotid artery, and posteriorly by the posterior border of the sternocleidomastoid muscle or cervical rootlets.⁸

Superior mediastinal dissections were performed transcervically without sternotomy in all patients. The boundaries of the dissection were the suprasternal notch superiorly, the common carotid arteries laterally, and the brachiocephalic artery and vein inferiorly. The common carotid artery is followed inferiorly to its origin. This nicely defines the anterosuperior compartment of the mediastinum, which is carefully dissected free. All feeding vessels are controlled with hemoclips and cautery. The superior mediastinal lymphatic tissue was excised en bloc and sent separately for pathologic evaluation. The superior mediastinal dissections were routinely performed by the senior author in less than 15 minutes. Patients underwent dissection of bilateral cervical nodal tissue in levels 1 to 6. An ipsilateral hemithyroidectomy was routinely performed in cases of advanced laryngeal carcinomas.

RESULTS

Fifty-six patients underwent elective transcervical superior mediastinal dissection, which included 42 patients with laryngeal SCCA and 14 patients with head and neck SCCA with N3 disease at level 4 (Table I) (Figs. 1 and 2). In the 14 patients with N3 disease at level 4, the primary sites of SCCA were the base of tongue (5 patients), anterior tongue (3), hypopharynx (1), oral cavity (1), oropharynx (1), and unknown primary (3). The mean age of patients was 59.5 years (standard deviation 12.9, range 22–85 years of age). Thirty-seven (66.1%) patients were males, and 19 (33.9%) were females.

Overall, superior mediastinal disease was present in 15 of 56 (26.8%) patients. Mediastinal disease was found in 11 of 42 (26.2%) patients with laryngeal SCCA and 4 of 14 (28.6%) patients with N3 SCCA involving level 4.

Prior organ preservation therapy with chemotherapy and radiotherapy (chemo/RT) was performed in 21 patients, including 15 of 42 (35.7%) patients with laryngeal SCCA and 6 of 14 (42.9%) patients with N3 SCCA at level 4. Patients receiving prior chemo/RT had a significantly higher rate of positive superior mediastinal nodes (10/21 patients, 47.6%) compared with patients without prior organ preservation therapy (5/35 patients, 14.3%, $P = .01$, Fisher's exact test). In the 42 patients with laryngeal

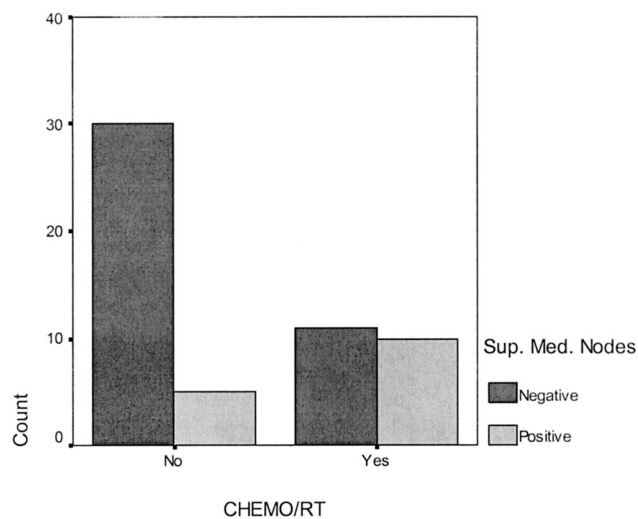


Fig. 1. Results of superior mediastinal dissection in 56 patients with laryngeal squamous cell carcinoma (SCCA) and N3 SCCA in level 4 evaluated for prior chemotherapy/radiotherapy.

SCCA, superior mediastinal nodes were positive in 6 of 15 (40%) patients with prior chemo/RT and 5/27 (18.7%) patients without chemo/RT ($P = .16$, Fisher's exact test). In the 14 patients with N3 disease in level 4, superior mediastinal dissections were positive in 4 of 6 (66.7%) patients with prior chemo/RT and negative in all 8 patients without chemo/RT ($P = .02$, Fisher's exact test). The primary site of SCCA in the four patients with positive mediastinal nodes included one anterior tongue, one base of tongue, one hypopharynx, and one unknown primary. Primary sites for the 10 patients with negative nodes included 2 anterior tongue, 4 base of tongue, 1 oral cavity, 1 oropharynx, and 2 unknown primaries. There were no major or minor complications that occurred during the superior mediastinal dissections such as injury to major vessels or pneumothorax.

DISCUSSION

Elective treatment of cervical lymphatics has been recommended when the risk of occult disease is greater than or equal to 20%.^{3,7} In our series of elective superior mediastinal dissections, patients with advanced laryngeal SCCA (26.2%), and N3 SCCA involving level 4 (28.6%) met the criteria for elective treatment accepted for cervical disease.

A significant incidence of superior mediastinal disease was also reported by Martins⁵ in a series of 34 patients treated with total pharyngolaryngoesophagectomy and gastric transposition. In 27 patients with available data treated with a transcervical approach for superior mediastinal dissection, 59.2% of patients had positive mediastinal lymphatics. The highest rate of disease occurred with hypopharyngeal (72.7%) and esophageal (61.5%) cancers. Three patients with transglottic laryngeal primaries had negative mediastinal nodes. The exposure provided by a total pharyngolaryngoesophagectomy facilitated transcervical dissection to the level of the aortic arch. Decreased locoregional recurrence was reported with medi-

TABLE I.

Pathologic Results of Superior Mediastinal Dissections.

	Negative (%)	Positive (%)	Total
Laryngeal SCCA	31 (73.8)	11 (26.2)	42
N3 SCCA level 4	10 (71.4)	4 (28.6)	14
Total	41 (60.5)	15 (26.8)	56

SCCA = squamous cell carcinoma.

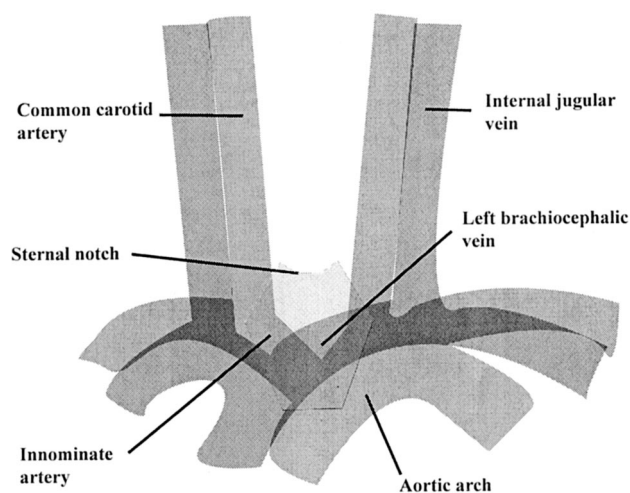


Fig. 2. Vascular anatomy.

astinal dissection (16%), but the overall 5-year survival remained low at 17.6% secondary to a high incidence of distant metastasis (83%).

A sternotomy may be performed to facilitate mediastinal dissection. Sisson and Goldman⁹ removed the manubrium and clavicular heads to allow mediastinal dissection inferiorly to the level of the aorta with peristomal recurrences.

Weber et al.⁴ reported a series of 141 patients treated with a total laryngectomy and paratracheal lymph node dissection. Overall, paratracheal nodes were positive in 20.5% of patients. The incidences of positive paratracheal nodes for the primary sites were 71.4% for cervical esophageal, 17.6% for laryngeal, and 8.3% for hypopharyngeal tumors.⁴

In a prospective study, Timon et al.⁷ reported positive paratracheal dissections extended inferiorly into the superior mediastinum in 20% of laryngeal and 43% of post-cricoid/cervical esophageal cancers. The majority of positive nodes were less than 1 cm and not apparent radiographically.⁷ Our findings correlate well with this study. The vast majority of positive superior mediastinal nodes were not grossly enlarged or clinically abnormal.

We found a significantly higher incidence of positive superior mediastinal dissections in patients treated with prior chemo/RT. This result may be secondary to selecting more aggressive subtypes of SCCA. In addition, organ preservation failure patients may have a higher incidence of positive mediastinal nodes because of a longer time period of disease compared with patients treated initially with surgery.

Our criteria to perform elective superior mediastinal dissection included 1) laryngeal cancer with airway obstruction, transglottic extension, or subglottic extension greater than 1 cm inferior to the vocal ligaments, 2) head and neck SCCA with N3 disease at level 4, and 3) any palpable abnormalities in the superior mediastinum. Subglottic extension has been confirmed to be a risk for mediastinal disease and increases the risk of stomal recurrence.¹⁰ By injecting the subglottic region with a colloidal

radiotracer, Welsh¹¹ demonstrated 96% uptake in the ipsilateral paratracheal nodes. Harrison¹² reported paratracheal nodal involvement in 15 of 25 patients with SCCA involving the subglottis.

A limitation of our series is that longer follow-up of our patients is necessary to determine locoregional control and survival data. Patients with advanced laryngeal carcinoma and N3 disease have been shown to have very low survival. Patients with N3 cervical disease are classified as stage IVB, with only patients with distant metastasis having a higher stage.⁸ A recent series demonstrated a 5-year survival of only 22.2% of patients with N3 cervical disease secondary to head and neck SCCA.¹³ Weber et al.⁴ reported that no patients with advanced laryngeal, hypopharyngeal, and cervical esophageal cancer survived greater than 42 months who had positive paratracheal nodes. This has not been our experience. A number of our patients who had positive superior mediastinal nodes are at 5 years or greater since initial treatment and are considered cured.

The risk for peristomal recurrence has been reported to be 2% to 10%.^{7,10,14,15} Leon et al.¹⁴ reported no stomal recurrences in patients with subglottic extension managed with hemithyroidectomy, paratracheal lymph node dissection, and tracheal resection. Timon et al.⁷ reported three stomal recurrences in a prospective series of 50 patients treated with laryngectomies. All three recurrences demonstrated positive paratracheal lymph nodes during the initial resection.⁷ In our series, there have been no stomal recurrences in the 42 patients with advanced laryngeal cancer treated with a laryngectomy, bilateral neck dissections, and superior mediastinal dissection despite a 26.2% incidence of mediastinal disease. By meeting criteria for elective superior mediastinal dissection, all 42 patients had advanced disease and 15 of 42 (35.7%) patients had failed prior chemo/RT.

CONCLUSIONS

Elective transcervical superior mediastinal dissection was positive in greater than 20% of patients with advanced laryngeal cancer and N3 disease at level 4. A transcervical approach may be safely performed to the level of the brachiocephalic veins without a sternotomy. Patients treated with prior chemo/RT had a significantly higher incidence of superior mediastinal nodes. There were no peristomal recurrences in the 42 patients with advanced laryngeal cancer in our series. Further study is necessary to determine whether elective superior mediastinal dissection impacts locoregional control and overall survival.

BIBLIOGRAPHY

1. Persky MS, Lagmay VM. Treatment of the clinically negative neck in oral squamous cell carcinoma. *Laryngoscope* 1999; 109:1160–1164.
2. Yuen APW, Wei WI, Wong WM, Tang KC. Elective neck dissection versus observation in the treatment of early tongue carcinoma. *Head Neck* 1997;19:583–588.
3. Weiss MH, Harrison LB, Isaacs RS. Use of decision analysis in planning a management strategy for the stage NO neck. *Arch Otolaryngol Head Neck Surg* 1994;120:699–702.
4. Weber RS, Marvel J, Smith P, et al. Paratracheal lymph node

- dissection for carcinoma of the larynx, hypopharynx, and cervical esophagus. *Otolaryngol Head Neck Surg* 1993;108:11–17.
5. Martins AS. Neck and mediastinal node dissection in pharyngolaryngoesophageal tumors. *Head Neck* 2001;23:772–779.
 6. Collin CF, Spiro RH. Carcinoma of the cervical esophagus: challenging therapeutic trends. *Am J Surg* 1984;148:460–465.
 7. Timon CV, Toner M, Conlon BJ. Paratracheal lymph node involvement in advanced cancer of the larynx, hypopharynx, and cervical esophagus. *Laryngoscope* 2003;113:1595–1599.
 8. American Joint Committee on Cancer. Cancer Staging Manual, 5th ed. Philadelphia: JB Lippincott, 1997.
 9. Sisson GA, Goldman ME. Pectoral myocutaneous island flap for reconstruction of stomal recurrences. *Arch Otolaryngol* 1981;107:446–449.
 10. Imauchi Y, Ito K, Takasago E, et al. Stomal recurrence after total laryngectomy for squamous cell carcinoma. *Otolaryngol Head Neck Surg* 2002;126:63–66.
 11. Welsh LW. The normal laryngeal lymphatics. *Ann Otol* 1964;73:569–582.
 12. Harrison DN. Laryngectomy for subglottic lesions. *Laryngoscope* 1975;85:1208–1210.
 13. Chan SW, Mukesh BN, Sizeland A. Treatment outcome of N3 nodal head and neck squamous cell carcinoma. *Otolaryngol Head Neck Surg* 2003;129:55–60.
 14. Leon X, Quer M, Burgues J, et al. Prevention of stomal recurrence. *Head Neck* 1996;18:54–59.
 15. Zbaren P, Greiner R, Kengelbacher M. Stoma recurrence after laryngectomy: an analysis of risk factors. *Otolaryngol Head Neck Surg* 1996;114:569–575.